

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 7

RECEIVED  
CENTRAL FAX CENTER

FEB 23 2007

REMARKS

Claims 1-3, 6, and 10-40, and 42-57 are pending in the above referenced application. Claims 1-3, 6, and 10-39, and 42-55 and 57 are rejected. Claims 40 and 56 are objected to. The applicant gratefully acknowledges the statement in the current Office Action that claims 40 and 56 contain patentable subject matter and would be allowed if rewritten in independent form.

Applicants respectively request reconsideration in view of the following claim amendments and remarks.

35 U.S.C. § 102(e) REJECTIONS

Claims 11, 14-19, and 27-28 stand rejected under 35 U.S.C. §102(b) as allegedly being anticipated by De Los Santos *et al.* (US 6,040,611). The Office Action states that De Los Santos *et al.* discloses a MEM device comprising a movable mechanism residing adjacent [to] a substrate; an abrasion resistant material localized on a first portion of the movable mechanism (30b) and *inter alia*, a second contact region (24b) comprising an abrasion resistive material that resides on the substrate, wherein the second contact material is similar to the first portion material. The Office Action asserts that it is inherent that the first portion of the mechanism would be subject to abrasion as the first portion of the mechanism becomes operationally coupled to the second contact region. The Office Action further asserts that the movable mechanism and the second contact region contain TiW, an art recognized abrasion resistant material.

The applicant respectfully disagrees. To anticipate a claim, a single source must contain all the elements of the claims, "arranged as in the claim." *Richardson v. Suzuki Motor Co.* 868 F.2d 1226, 1236, 9 U.S.P.Q2d 1913, 1920 (Fed. Cir 1989). Applicant has previously pointed out that De Los Santos *et al.* describes that Ti-W is used as an adhesion layer for Au (column 5, lines 9-12). The Office Action argues that the contact contains TiW and therefore is abrasion resistant. Furthermore, the Office Action argues that "the TiW layer under the gold layer of the lever contact would be in electrical contact with the substrate contact, and therefore the TiW material is in operational contact as required by claim 11." (See page 12 point 14). The Office Action

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033

7

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 8

acknowledges that the contact is not solely TiW but Au with an adhesion layer of TiW. The fact that the TiW adhesion layer is in operational contact is moot because clearly neither Au or Au with a TiW adhesion layer can be considered abrasion resistant. To further distinguish the present invention from the De Los Santos *et al.* reference, the limitation from claim 13 has been incorporated into claim 11. The De Los Santos *et al.* reference does not anticipate the present invention because it does not contain all the elements of amended claim 11 and the claims depending therefrom. Applicant respectfully requests that the rejection under 35 U.S.C. §102(b) be withdrawn.

Claims 11-17 and 27 are rejected under 35 U.S.C. §102(e) as allegedly being anticipated by Ma *et al.* (US 6,621,022). The Office Action states that Ma *et al.* discloses a MEM device comprising a movable mechanism residing adjacent a substrate, a diamond abrasion resistant material localized on a first portion of the movable mechanism and a first contact region localized on the substrate used to attract the movable mechanism towards the substrate such that the abrasion resistant material becomes operationally coupled to a second contact region residing on the substrate.

The applicant respectfully disagrees. Applicant has amended claim 11 to incorporate the limitation of claim 13. Ma *et al.* describe a durable coating layer that protects a first contact from wear. Whatever else Ma *et al.* teaches, it does not teach a first portion subject to abrasion as the abrasion resistant material becomes operationally coupled to said second contact region, and therefore does not contain all the elements of the claim arranged as in the claim. For at least this reason, Ma *et al.* is not anticipatory to claim 11 or the claims depending therefrom.

Claims 39, 42-50, 52-55 and 57 are rejected under 35 U.S.C. §102(e) as allegedly being anticipated by Ruan *et al.* (6,469,602). The Office Action states that Ruan *et al.* discloses an integral micro-machined structure for enclosing a MEM device comprising a structure extending from a substrate and enclosing the MEM device and a contact region provided on the cover substrate structure and acting as a pullback contact for a MEM device residing on the substrate, wherein the micro-machined structure defines a tortuous, labyrinth path.

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033

8

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 9

The applicant respectfully disagrees. However, to advance prosecution of this application claim 39 has been amended with the limitations of claim 40. Additionally, the limitations of claim 56 have been incorporated into claim 52. The Office Action has previously stated that claims 40 and 56 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The amended claims 39 and 52 represent such a rewritten presentation of claims 40 and 56, respectively, and therefore are allowable. The applicant respectfully requests that the rejection of claims 39, 42-50, 52-55 and 57 under 35 U.S.C. §102(e) be withdrawn.

### **35 U.S.C. § 103(a) REJECTIONS**

Claims 1-3, 6 and 10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Daneman *et al.* (6,528,887) in view of Lin *et al.* (NPL reference U). The Office Action states that Daneman *et al.* discloses a movable micromachined structure comprising a lever mechanism, with a conductive diamond material defining an abrasion resistive contact area disposed a surface of the structure. The Office Action also states that Daneman *et al.* fails to disclose the movable lever mechanism to comprise a rib enforced mechanism. The Office Action relies on the Lin reference to provide a teaching of a movable micro-machined structure comprising a rib enforced lever mechanism. The Office Action asserts that it would have been obvious to one of skill in the art at the time the invention was made to use the rib enforced lever of Lin *et al.* in the switch of Daneman *et al.*, motivated by the teaching of Lin *et al.* that using a rib enforced lever reduces deformation and extends the lifetime of a switch device. Additionally the Office Action asserts that the applicant has used the terms beam, lever and arm interchangeably, and therefore are considered functional equivalents.

The applicant respectfully disagrees. The applicant uses the terms “cantilever beams” and “cantilevers” only in describing the prior art. In paragraphs 44 and 45 the applicant is illustrating known MEM devices. In paragraph 46, applicant illustrates aspects of the present invention. The applicant uses lever to describe the element of the present invention. The applicant disagrees that an arm or beam would read on the term lever as defined by the dictionary

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033

9

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 10

or in the applicant's specification. However, to advance the prosecution of this application, the applicant has canceled claims 1-3, 6 and 10, without prejudice. The rejection under 35 U.S.C. §103(a) is therefore moot.

Claims 20-23 29-31, 34-36, and 38 are rejected under 35 U.S.C 103(a) as being unpatentable over De Los Santos *et al.* in view of Lin *et al.* The Office Action states that the process limitations of the claims 22, 23 and 36 invoke the product by process doctrine, and therefore anticipation only requires that the layer has a planar surface. The Office Action states that De Los Santos *et al.* fails to disclose the surface to define an integral rib. The Office Action relies upon Lin *et al.* to teach a movable mechanism with a second surface defining an integral rib. The Office Action asserts that it would have been obvious to one of skill in the art at the time the invention was made to use the rib enforced mechanism of Lin *et al.* in the switch mechanism of De Los Santos *et al.* because Lin *et al.* teach that the standard levers used in switches become deformed under electrostatic forces, and using a rib enforced lever reduces this deformation.

The applicant respectfully disagrees. However, to expedite prosecution of this application claims 22, 23 and 36 have been canceled, without prejudice. De Los Santos *et al.* describe the operation of the switch being controlled by the voltages applied on either side of the anchor; hence the switching frequency is independent from the stiffness of the beam (column 4, lines 58-63). The De Los Santos *et al.* MEM device does not rely on the stiffness of the beam to improve the switch but instead by controlling the actuation voltage. (See column 4, lines 60-62) Therefore, one of skill in the art would not have been motivated to modify the De Los Santos *et al.* switch with a rib enforced beam of Lin *et al.* in order to improve the switch. Additionally, one of skill in the art could not have been motivated by the desire to extend the lifetime of the switch because extending the lifetime of the switch is not described or suggested by the prior art. At best, the idea of introducing a rib enforced beam to extend the lifetime of a switch would have been a good invitation to experiment, but would not have involved a reasonable expectation of success. Lin *et al.* simply disclose the increase in the bending stiffness of the rib-reinforced

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033

10

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 11

beam. Increasing the bending stiffness of the De Los Santos *et al.* switch would not have led to an improvement. The prior art does not suggest the desirability of the modification and therefore cannot be used to establish a *prima facie* obviousness rejection.

Claims 24-26, and 33 are rejected under 35 U.S.C 103(a) as being unpatentable over De Los Santos *et al.* in view of Lin *et al.* and further in view of Daneman *et al.* The Office Action states that the De Los Santos and Lin references fail to explicitly teach an integral enclosure that electrically shields and encloses the MEM device. The Office Action relies on Daneman *et al.* to teach a MEM device comprising a movable micro-machined structure with an integral enclosure that electrically shields and encloses the MEM device. The Office Action asserts that it would have been obvious to one of skill in the art at the time the invention was made to use the integral enclosure of Daneman *et al.* in the device described by De Los Santos *et al.* in view of Lin *et al.* because it is well known in the art that the insulating enclosure would have both reduced the switch's susceptibility to electrical noise and protected it from environmental conditions. The Office Action additionally asserts that that using integral enclosures to insulate semiconductor devices from electrical noise and environmental conditions is conventional and necessary for the devices to perform their intended function, and would be obvious to one of ordinary skill in the art to employ such an enclosure. Additionally, the Office Action states that the De Los Santos *et al.* and Lin *et al.* references fail to teach the conductive layer to comprise diamond. The Office Action relies on Daneman *et al.* to provide a movable mechanism with a conductive diamond material on the mechanism. The Office Action states that it would have been obvious to one of skill in the art at the time the invention was made because diamond was well known as the hardest material and would have improved the abrasion resistance.

The applicant respectfully disagrees. The deficiencies of De Los Santos *et al.* and Lin *et al.* have been discussed previously. The applicant does not agree that it is conventional to use integral enclosures. More importantly Daneman *et al.* do not describe an integral enclosure in Figures 10A-10F. Figures 10A-10F depict the fabrication of the MEM device shown in Figure 9, which does not contain an enclosure, much less an integral enclosure. Additionally, De Los

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033

11

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 12

Santos *et al.* describes controlling the speed of contact to extend the contact life, thereby offering no motivation to use a conductive layer comprising diamond. Therefore, there exists no mention in the prior art of an integral enclosure or that a diamond conductive surface would improve the invention of De Los Santos *et al.* in view of Lin *et al.* For at least the reasons provide above,  
5 claims 22-24 and 33 are not obvious over De Los Santos *et al.* in view of Lin *et al.* and further in view of Daneman *et al.*

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over De Los Santos *et al.* in view of Lin *et al.* and further in view of Ruan *et al.* The Office Action states that the above references do not teach the conductive layer to comprise copper. The Office Action relies on  
10 Ruan *et al.* to provide a MEM device comprising a movable mechanism with a conductive copper material on the mechanism. The Office Action asserts that it would have been obvious to one of skill in the art at the time the invention was made because Ruan *et al.* teach copper is an art recognized functional equivalent to the gold containing conductive layer of De Los Santos *et al.*

15 The applicant respectfully disagrees. The deficiencies of De Los Santos *et al.* in view of Lin *et al.* have been discussed previously. However to advance the prosecution of this application, claim 32 has been canceled.

Additionally, applicant has canceled claim 37, without prejudice, in order to expedite the prosecution.

20 Claim 51 is rejected under 35 U.S.C. §103(a) as being unpatentable over Ruan *et al.* in view of Clevenger *et al.* ( U.S. Application No. 20010014526). The Office Action states that Ruan *et al.* fail to teach the structure for enclosing the device to comprise diamond. The Office Action relies on Clevenger *et al.* to provide a method of forming a microelectronic device having an enclosed cap comprising diamond. The Office Action asserts that it would have been obvious  
25 to one of skill in the art at the invention was made to use the diamond material of Clevenger *et al.* in the enclosing cap of Ruan *et al.* because a diamond cap would have provided improved thermal conductivity over the material and allowed the dissipation of heat.

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033

12

2/23/2007 Response to Office Action  
U.S.S.N. 10/689,167

Page 13

The applicant respectfully disagrees. Claim 39 has been amended to place it in allowable condition. Applicant respectfully requests that the rejection under 35 U.S.C. §103(a) be withdrawn as claim 51 now depends on amended claim 39.

For at least the reasons stated above, the applicants respectfully request that all the  
5 rejections under 35 U.S.C. 103(a) be withdrawn.

In view of the remarks and amendments above, the applicants respectfully submit that the present application is in condition for allowance and solicits action to that end. If there are any additional matters that may be resolved or clarified through a telephone interview, the Examiner is respectfully requested to contact applicant's undersigned representative.

Respectfully submitted,

By:



Thomas Omholt  
Reg. No. 37,052

Cabot Microelectronics Corporation  
870 North Commons Drive  
Aurora, IL, 60504  
Tel. (630) 375-2033.

13